Proposed Registration Decision PRD2011-19

Spiromesifen

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Overview

Proposed Registration Decision for Spiromesifen

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing continued conditional registration for the sale and use of Spiromesifen Technical Insecticide/Miticide, Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide containing the technical grade active ingredient spiromesifen to control mites and whiteflies on greenhouse and outdoor ornamentals, on greenhouse and field vegetables as well as on strawberries.

Spiromesifen Technical Insecticide/Miticide (Registration Number 28589) and Forbid 240 SC Insecticide/Miticide (Registration Number 28590) are conditionally registered in Canada. The detailed review for Spiromesifen Technical Insecticide/Miticide and Forbid 240 SC Insecticide/Miticide can be found in the Evaluation Report, ERC2007-08: *Spiromesifen*. Subsequent to the original applications, an application to transfer the field crop uses from the Forbid 240 SC Insecticide/Miticide label to the Oberon Flowable Insecticide-Miticide label (Registration Number 28905) was reviewed and conditionally approved. The current applications were submitted to convert Spiromesifen Technical Insecticide/Miticide, Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide from conditional registration to full registration.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

Although the risks and value have been found acceptable when all risk reduction measures are followed, the applicant must submit additional scientific information as a condition of registration.

This Overview describes the key points of the evaluation, while the Science Evaluation section of this document and the Evaluation Report, ERC2007-08: *Spiromesifen*, provides detailed technical information on the human health, environmental and value assessments of Spiromesifen Technical Insecticide/Miticide, Forbid 240 SC Insecticide/Miticide, and Oberon Flowable Insecticide-Miticide.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable[1] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The Act also requires that products have value[2] when used according to the label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (e.g. children) as well as organisms in the environment (e.g. those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the Pesticide and Pest Management portion of Health Canada's website at healthcanada.gc.ca/pmra.

Before making a final registration decision on spiromesifen, the PMRA will consider all comments received from the public in response to this consultation document[3]. The PMRA will then publish a Registration Decision[4] on spiromesifen, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA's response to these comments.

For more details on the information presented in this Overview, please refer to the Science Evaluation of this consultation document as well as the Evaluation Report, ERC2007-08: *Spiromesifen*.

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1 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act*.

2 "Value" as defined by subsection 2(1) of the *Pest Control Products Act*: "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (*a*) efficacy; (*b*) effect on host organisms in connection with which it is intended to be used; and (*c*) health, safety and environmental benefits and social and economic impact."

3 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

4 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

What Is Spiromesifen?

Spiromesifen is a foliar applied, contact insecticide used to control mites and whiteflies. It is applied to greenhouse vegetables and ornamentals, field corn, cucurbits, leafy greens, leafy brassicas, tuberous and corm vegetables, fruiting vegetables, alfalfa and strawberries using ground, and in some instances, aerial application equipment. Spiromesifen inhibits lipid biosynthesis in target insects and is effective against all immature life stages. It may have indirect effects on adults of some target pest species.

Health Considerations

Can Approved Uses of Spiromesifen Affect Human Health?

Spiromesifen is unlikely to affect your health when used according to the label directions.

People could be exposed to spiromesifen through diet (food and water) or when handling and applying Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide. When assessing health risks, the PMRA considers two key factors: the levels at which no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (e.g. children and nursing mothers).

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose at which no effects are observed. The health effects noted in animals occur at doses more than 100-times higher (and often much higher) than levels to which humans are normally exposed when products containing spiromesifen are used according to the label directions.

The technical grade active ingredient spiromesifen caused allergic skin reactions in animals. Consequently, the statement "Potential Dermal Sensitizer" is required on the label for the technical grade active ingredient. The end-use products Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide caused slight toxicity in animals when inhaled. Consequently, the statement "Caution—Poison" is required on the label for the end-use products. Spiromesifen did not cause cancer in animals and was not genotoxic. Health effects in animals given daily doses of spiromesifen over long periods of time included effects on the spleen, liver, uterus, thyroid gland and adrenal gland. When spiromesifen was given to pregnant animals, effects on the developing fetus were observed at doses that were toxic to the mother, indicating that the fetus is not more sensitive to spiromesifen than the adult animal. Effects on the young animal, however, were slightly more severe than those observed in parental animals after the parental animals were given daily doses of spiromesifen before mating, during pregnancy and while providing nourishment to the young animal through lactation. Signs of potential neurotoxicity were observed at doses that caused other effects in test animals. The risk assessment protects against these effects by ensuring that the level of human exposure is well below the lowest dose at which these effects occurred in animal tests. Only those uses where exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

Residues in Water and Food

Dietary risks from food and water are not of concern.

Aggregate chronic dietary intake estimates (food plus water) revealed that children (1 to 2 years old), the subpopulation which would ingest the most spiromesifen relative to body weight, are expected to be exposed to less than 41% of the acceptable daily intake. Based on these estimates, the chronic dietary risk from spiromesifen is not of concern for all population sub-groups.

Animal studies revealed no acute health effects. Consequently, a single dose of spiromesifen is not likely to cause acute health effects in the general population (including infants and children).

The *Food and Drugs Act (FDA)* prohibits the sale of adulterated food, that is, food containing a pesticide residue that exceeds the established maximum residue limit (MRL). Pesticide MRLs are established for FDA purposes through the evaluation of scientific data under the *Pest Control Products Act.* Food containing a pesticide residue that does not exceed the established MRL does not pose an unacceptable health risk.

Residue trials conducted throughout Canada and the United States using spiromesifen on various fruit and vegetable crops were acceptable. The reviews for this active ingredient can be found in the Evaluation Report, ERC2007-08, and in the Evaluation Report (Application Number 2008-5063) located within the PMRA Public Registry on the Health Canada Website. The MRLs for this active ingredient can be found in the Established Maximum Residue Limit documents EMRL2008-17 and EMRL2011-29.

Workplace Risks From Handling Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide

Occupational risks are not of concern when Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide are used according to the label directions, which include protective measures.

Farmers and pesticide applicators mixing, loading or applying Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide as well as workers entering fields or greenhouses of freshly treated crops can come in direct contact with spiromesifen on the skin or through inhalation of spray mists. Therefore, the label specifies that anyone mixing or loading Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide must wear a long-sleeved shirt, pants, chemical-resistant gloves, a respirator with appropriate filter and goggles or a face shield and that anyone applying the product must wear a long-sleeved shirt and pants. Based on these label statements, risks to farmers, applicators or workers are not a concern.

For members of the general population that are at pick-your-own facilities, exposure is not of concern because there were no acute concerns for spiromesifen identified in the toxicological database.

Environmental Considerations

What Happens When Spiromesifen Is Introduced Into the Environment?

Spiromesifen is toxic to terrestrial plants and aquatic organisms, therefore, buffer zones are required during application.

Spiromesifen enters the environment when used as an insecticide on a variety of crops including field corn, cucurbits, leafy greens, leafy brassicas, tuberous and corm vegetables, fruiting vegetables, alfalfa and strawberries. Spiromesifen is not persistent to moderately persistent in soil (depending on soil characteristics) and slightly persistent in water, while the major transformation product, BSN 2060-enol, is persistent in water, and slightly to moderately persistent in soil (depending on soil characteristics). Spiromesifen is not expected to leach through the soil profile beyond 30 cm; and therefore is not expected to enter groundwater. In contrast, BSN 2060-enol is mobile and expected to leach and enter groundwater. Based on its low volatility, spiromesifen residues are not expected in the air.

During the original review (reported in the Evaluation Report, ERC2007-08: *Spiromesifen*) it was determined that spiromesifen does not present a risk to wild mammals, birds, adult bees, marine invertebrates, algae and aquatic plants. However, spiromesifen does affect terrestrial plants, predators and parasites, daphnia, freshwater and marine fish, and amphibians in adjacent areas. Therefore, to protect from the effects of spray drift, buffer zones were required on the label to protect sensitive aquatic species and non-target plant species in adjacent habitats.

During the recent review of spiromesifen, a number of additional field and semi-field bee hive studies were submitted for review. From theses studies, it was determined that spiromesifen poses a potential risk to honeybee brood. If applied to blooming plants, it may be possible that nectar and pollen can be brought back to the hive resulting in exposure to spiromesifen. In the studies, there was also indication of hive recovery. Therefore, in order to further characterize the potential risk to brood, additional information is being requested from the registrant to address the above mentioned concerns.

Value Considerations

What Is the Value of Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide?

Spiromesifen, an insecticide/miticide, controls specific mites and whiteflies on greenhouse vegetables and ornamentals, field corn, cucurbits, leafy greens, leafy brassicas, fruiting vegetables, alfalfa, tuberous and corm vegetables, and strawberries.

A single application of spiromesifen provides control of specific mites and whiteflies on a variety of crops, in both greenhouses and outdoors. It is also compatible with current management practices and conventional crop production systems. Growers are familiar with the monitoring techniques to determine if and when applications are needed. Spiromesifen is the active ingredient found in two end-use products, Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide.

One other registered miticide, spirotetramat, from the same resistance management class as spiromesifen can be applied to several vegetable crop groups to control whiteflies. While spiromesifen offers a new class for resistance management purposes to some crops, prudent rotation and alternation will be required to prevent the onset of resistance where both active ingredients are registered.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law.

The key risk-reduction measures currently on and being proposed on the label of Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

Human Health

As there is a concern with users coming into direct contact with spiromesifen on the skin or through inhalation of spray mists, anyone mixing or loading Forbid 240 SC Insecticide/Miticide or Oberon Flowable Insecticide-Miticide must wear a long-sleeved shirt, pants, chemical-resistant gloves, a respirator with appropriate filter and goggles or a face shield. Anyone applying these products must wear a long-sleeved shirt and pants.

Environment

Buffer zones are required for Oberon Flowable Insecticide-Miticide to protect susceptible non-target plant species and susceptible aquatic organisms. The distance allowed depends on the type of spray equipment used to apply the product, the type of habitat and the crop being sprayed with the product (please refer to the label).

Hazard statements to identify potential effects on brood and limitations for application during bloom will be required on both end-use product labels.

What Additional Scientific Information is Being Requested?

Environment

Additional information to further characterize the potential risk to brood is required.

Next Steps

Before making a final registration decision on spiromesifen, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency's response to these comments.

Other Information

When the PMRA makes its registration decision, it will publish a Registration Decision on spiromesifen (based on the Science Evaluation section of this consultation document). In addition, the test data referenced in this consultation document as well as in ERC2007-08: *Spiromesifen* will be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa).

Science Evaluation

Spiromesifen

1.0 The Active Ingredient, Its Properties and Uses

Refer to the Evaluation Report, ERC2007-08: *Spiromesifen*, for the chemistry review for spiromesifen and its associated end-use product, Forbid 240 SC Insecticide/Miticide.

Both Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide are a liquid containing the active ingredient spiromesifen at a nominal concentration of 240 g/L. These products have a density of 1.029 g/cm^3 and pH of 4.6 for a 10% solution in water. The chemistry requirements for Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide have been completed.

1.1 Directions for Use

Since the conditional registration was granted for Forbid 240 SC Insecticide/Miticide, the outdoor food uses have been transferred to the label of Oberon Flowable Insecticide-Miticide. As well, greenhouse eggplant was added to the label of Forbid 240 SC Insecticide/Miticide and alfalfa grown for seed was added to the label of Oberon Flowable Insecticide-Miticide. Forbid 240 SC Insecticide/Miticide can be applied to crops listed in Table 1.1, while Oberon Flowable Insecticide-Miticide can be applied by both ground and air to crops listed in Table 1.2.

Table 1.1. Insect Control Claims for Forbid 240 SC Insecticide/Miticide

Crop	Pest	Rate	Maximum Number of Applications
Greenhouse vegetables (tomatoes, pepper, cucumber, and eggplant[1])	Two spotted spider mite	0.03 - 0.05% (0.072-0.120 g a.i./L)	two times per crop cycle
	Whiteflies	0.03 - 0.05% (0.072-0.120 g a.i./L)	
Greenhouse ornamentals	Two-spotted spider mite	0.03% (0.072 g a.i./L)	two times per crop cycle
	Whiteflies	0.03% (0.072 g a.i./L)	
Outdoor ornamentals	Mites	0.03% (0.072 g a.i./L)	two times per crop cycle
	Whiteflies	0.03% (0.072 g a.i./L)	

[1]Use added since initial registration

Table 1.2. Insect Control Claims for Oberon Flowable Insecticide-Miticide

Crop	Pest	Rate	Maximum Number of Applications per season
Field Corn	Two-spotted spider mite Banks grass mite	96 - 144 g a.i./ha	2
Cucurbit Vegetables (Crop Group 9)	Two-spotted spider mite	120 - 144 g a.i./ha	3
	Whiteflies	120 - 144 g a.i./ha	
Fruiting Vegetables (Crop Group 8)	Two-spotted spider mite Broad mite	120 - 144 g a.i./ha	3
	Whiteflies	120 - 144 g a.i./ha	
Leafy Greens Vegetables (Crop Subgroup 4A)	Whiteflies	120 - 144 g a.i./ha	3
Brassica Leafy Vegetables (Crop Group 5)	Whiteflies	120 - 144 g a.i./ha	3
Tuberous and corm vegetables (Crop subgroup 1C)	Two-spotted spider mite	120 - 144 g a.i./ha	2
	Whiteflies	120 - 144 g a.i./ha	
Strawberry	Two-spotted spider mite	211 - 278 g a.i./ha	3
	Whiteflies	211 - 278 g a.i./ha	
Alfalfa (grown for seed)[1]	Two spotted spider mite	120 – 240 g a.i./ha	No more than 720 g a.i./ha/year

[1]Use added since initial registration

1.2 Mode of Action

Refer to ERC2007-08 for the discussion about the mode of action of spiromesifen.

2.0 Methods of Analysis

Refer to ERC2007-08 for the review of methods analysis for spiromesifen and the associated end-use products.

3.0 Impact on Human and Animal Health

3.1 Toxicology

The toxicology database for Spiromesifen Technical Insecticide/Miticide and the acute toxicity of Forbid 240 SC Insecticide/Miticide was reviewed previously and is summarized in ERC2007-08. The acute toxicity profile of Oberon Flowable Insecticide-Miticide is considered to be equivalent to that of Forbid 240 SC Insecticide/Miticide. No toxicology data requirements were required as a condition of registration.

3.2 Occupational Exposure and Risk

The exposure of Forbid 240 SC Insecticide/Miticide was previously reviewed and is summarized in ERC2007-08. It is not expected that exposure to mixer/loader/applicators and re-entry workers will increase over the exposure from the current conditionally registered uses.

The exposure of Oberon Flowable Insecticide-Miticide was previously reviewed under Forbid 240 SC Insecticide/Miticide, which initially included applications to outdoor field crops, and is summarized in ERC2007-08. It is not expected that exposure to mixer/loader/applicators and re-entry workers will increase over the exposure from the current conditionally registered uses.

3.3 Food Residues Exposure Assessment

3.3.1 Residues in Plant and Animal Foodstuffs

Refer to ERC2007-08 for a summary of the data previously reviewed and the rationale for the regulatory decision. The information captured herein relates to the freezer storage stability data provided in support of the conversion from conditional to full registration.

The freezer storage stability data identified as a condition of registration in ERC2007-08 were submitted and deemed to be adequate. Residues of spiromesifen (BSN 2060) and the metabolites BSN 2060-enol and BSN 2060-4-hydroxymethyl are stable during frozen storage for at least 22 months in the rotational crop commodities of turnip roots, wheat forage, wheat hay and wheat grain. Additional information was provided demonstrating that residues of spiromesifen (BSN 2060), BSN 2060-enol and BSN 2060-4-hydroxymethyl would be stable in turnip tops for 18 months.

Based on this freezer storage stability data and additional available information, residues of spiromesifen (BSN 2060), BSN 2060-enol and BSN 2060-4-hydroxymethyl are expected to be stable in the rotational crops of alfalfa, barley, wheat and sugarbeet roots for 22 months, and in sugarbeet tops for 18 months under frozen conditions.

4.0 Impact on the Environment

4.1 Fate and Behaviour in the Environment

The physical and chemical properties and environmental fate of spiromesifen have been previously reviewed and reported in ERC2007-08.

4.2 Environmental Risk Characterization

The environmental risk assessment integrates the environmental exposure and ecotoxicology information to estimate the potential for adverse effects on non-target species. This integration is achieved by comparing exposure concentrations with concentrations at which adverse effects occur. For higher tier studies, such as field and semi-field honeybee studies, the results of the studies are compared with Canadian label rates and use patterns in order to assess the potential risk to pollinators.

4.2.1 Risk to Terrestrial Organisms

The effects of spiromesifen on terrestrial organisms from spray applications have been previously reviewed and reported in the ERC2007-08.

A new assessment was conducted to characterize the potential risk to pollinators (including hive and brood effects). This assessment was based upon studies submitted for review during the conditional registration period, and includes the following studies:

- A greenhouse study with exposure of honeybees to zucchini treated with Spiromesifen SC 240.
- A honey bee field study in melons treated with Oberon 2SC Insecticide.
- A honey bee field study in cotton treated with Oberon 2SC Insecticide.
- A semi-field study in buckwheat was conducted.

The results of the greenhouse, and cotton studies indicate that larvae and egg numbers were reduced in treated field hives compared to control hives after applications of spiromesifen. There were also effects observed in some of the studies such as decreased hive weight, drone mortality and increased foraging activity. The studies indicated recovery of the hive (including increased larvae and egg numbers), however, there is some uncertainty with this interpretation as the bees were not tracked for a sufficient period of time to ensure that recovery was complete and permanent. Other uncertainties include the application rates in the study as compared to Canadian rates, the potential for overwintering effects, control contamination in the field studies, and high data variability which made it difficult to interpret the data (refer to Table 2, Appendix I). In order to mitigate for the current uncertainties, the PMRA is proposing to minimize potential exposure using label mitigation for timing of application.

4.2.2 Effects on Aquatic Organisms

The effects of spiromesifen on aquatic organisms from spray applications have been previously reviewed and reported in ERC2007-08.

4.2.3 Incident Reports

Since April 26, 2007, registrants have been required by law to report incidents, including adverse effects to health and the environment, to the PMRA within a set time frame. Information on the reporting of incidents can be found on the PMRA website http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/incident/index-eng.php.

As of July 2011, the PMRA is not aware of any relevant incident reports related to adverse effects on bees from spiromesifen use in Canada and/or the United States.

5.0 Value

Refer to ERC2007-08 for a detailed assessment of the value and efficacy of spiromesifen. No further value data were required to fulfil the conditions outlined at the time of registration. Since initial registration, the outdoor vegetable uses have been moved from the Forbid 240 SC Insecticide/Miticide label to the Oberon Flowable Insecticide-Miticide label. As well, greenhouse eggplant was added to the Forbid 240 SC Insecticide/Miticide label and alfalfa (grown for seed) was added to the Oberon Flowable Insecticide-Miticide label.

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e., persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the review process, spiromesifen and its transformation products were assessed in accordance with the PMRA Regulatory Directive DIR99-03[5] and evaluated against the Track 1 criteria. The PMRA has reached the following conclusions:

- It was previously determined that technical grade spiromesifen does not meet all Track 1 criteria and does not form any transformation products which meet Track 1 criteria (refer to ERC2007-08).

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5 DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

- Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide do not contain formulants that are known to be TSMP Track 1 substances.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02[6].

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical and formulants and contaminants in the end-use products are compared against the *List of Pest control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*[7]. The list is used as described in the PMRA Notice of Intent NOI2005-01[8] and is based on existing policies and regulations including: DIR99-03; and DIR2006-02[9], and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

- Technical grade spiromesifen as well as the Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide end-use products do not contain any formulants or contaminants of health or environmental concern identified in the *Canada Gazette*.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02[10].

7.0 Summary

7.1 Human Health and Safety

Refer to ERC2007-08 for details concerning human health and safety. The freezer storage stability data requirement identified in ERC2007-08 was addressed and deemed to be adequate.

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6 DIR2006-02, PMRA Formulants Policy.

7 *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-114 (2005-11-30) pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613. *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

8 NOI2005-01, List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern under the New Pest Control Products Act.

9 DIR2006-02, PMRA Formulants Policy.

10 DIR2006-02, PMRA Formulants Policy.

7.2 Environmental Risk

Refer to ERC2007-08 for details concerning environmental risk. There is potential risk to honeybee brood from foliar application of spiromesifen to flowering plants.

7.3 Value

Refer to ERC2007-08 for a full overview of the value of spiromesifen. Forbid 240 SC Insecticide/Miticide controls whiteflies and selected mites on greenhouse tomato, cucumber, eggplant, and pepper; greenhouse ornamentals; and outdoor ornamentals. Oberon Flowable Insecticide-Miticide controls whiteflies and selected mites on field vegetables, field corn, strawberries, and alfalfa. Spiromesifen offers a new class of insecticide for resistance management purposes to some vegetables crops; however, prudent rotation and alternation will be required to prevent the onset of resistance where other group 23 insecticides, like spirotetramat, are registered to control the same pest.

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, is proposing continued conditional registration for the sale and use of Spiromesifen Technical Insecticide/Miticide, Forbid 240 SC Insecticide/Miticide and Oberon Flowable Insecticide-Miticide containing the technical active ingredient spiromesifen to control mites and whiteflies on greenhouse and outdoor ornamentals, on greenhouse and field vegetables as well as on strawberries.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

Although the risks and value have been found acceptable when all risk-reduction measures are followed, as a condition of these registrations, additional scientific information is being requested from the applicant. For more details, refer to the Section 12 Notice associated with these conditional registrations. The applicant will be required to submit this information within the time frames indicated below.

Environment

Additional information to further characterize the potential risk to honeybee brood is required. The information must be provided to the Pest Management Regulatory Agency by September 1, 2014.

List of Abbreviations

°C	degree(s) Celsius
a.i.	active ingredient
cm	centimetre(s)
cm^3	centimetre(s) cubed
DACO	data code
EMRL	Established Maximum Residue Limit document
ERC	Evaluation Report
FDA	*Food and Drugs Act*
g	gram(s)
ha	hectare(s)
L	litre(s)
lbs	pound(s)
MRL	maximum residue limit
PMRA	Pest Management Regulatory Agency
ppm	parts per million
SC	soluble concentrate
TSMP	Toxic Substances Management Policy

Appendix I Tables and Figures

Table 1 Storage Stability

Storage Stability	PMRA No. 1830056, 1963098
Samples of turnip root, wheat forage, wheat hay and wheat grain were spiked with a 1.0 ppm mixture of spiromesifen (BSN 2060) and the metabolite BSN 2060-enol, or spiked with the metabolite BSN 2060-4-hydroxymethyl at 1.0 ppm, and stored at <-10°C for 22 months. The results showed that residues of spiromesifen, BSN 2060-enol and BSN 2060-4-hydroxymethyl were stable in the tested commodities for this duration. Further to this, based on the information provided in a scientific rationale and previously reviewed freezer storage stability data, there is sufficient evidence showing that residues of spiromesifen, BSN2060-enol and BSN2060-4-hydroxymethyl would be stable in sugarbeet tops after 18 months of frozen storage.	

Table 2 Toxicity of Spiromesifen to Honeybees

Study	Interpretation	Uncertainties
PMRA No.1919148. A **greenhouse study** to determine the effects of Spiromesifen SC 240 on the honeybee, under particular consideration of effects to the development of honeybee brood. **Rate:** 184 g a.i./ha x 2 **Crop:** Zucchini	• **Brood effect confirmed in this study.** • **Increased foraging activity in the treated bees may be an indication of colony stress** • No significant effects observed on the adult bees. • Drone mortality observed. • Overall, increase in foraging and reduced number of brood might have led to increased honey production and pollination.	**Uncertainties (which affect interpretation of results)** • It is uncertain if the colonies were tracked for a sufficient period of time to insure that recovery actually took place or whether the last assessment represented a temporary spike in performance. **Thus, there is uncertainty if colonies will recover from exposure to spiromesifen.** • It is uncertain if bees (under Canadian field conditions) would have a five week length of time (as measured in the study) for recovery after application. • The single rate of application (184 g a.i./ha) was below the highest single application rate for use in Canada (278 g a.i./ha for strawberries and 240 g a.i./ha for alfalfa) and higher than the single rate for cucumber (144 g/ha). The cumulative rate (368 g a.i./ha) was below the maximum Canadian label rate of 835 g a.i./ha. • The condition of the hive the following season (potential overwintering effects) is not known. • The potential effects to solitary bees and biodiversity is unknown.
PMRA No. 1919151. Honey Bee Field Study in **Melons** Treated with Oberon 2SC **Rate**: 145 g a.i./ha x 3 **Crop**: Muskmelon	• Colony weight was lower in treated hives compared to controls • Significant effect on flight activity and drone mortality. • No significant difference between control and treated for brood effect, but this could be due to the	**Uncertainties (which affect interpretation of results)** • The study was conducted at late season when bees may be preparing for overwintering. This may not be an ideal time frame for studying on brood effect. • There was cross contamination (control hives contained spiromesifen). • There were a number of "other" bee-toxic residues found in the control and

Study	Interpretation	Uncertainties
	following uncertainties.	treated hives (including imidacloprid, difenthron, methomyl and diazinon) which may have led to decreased control colony success for comparison. • Varroa mite infestation was higher in all test groups, and thus potentially confounded the result. • There might be increased foraging activity in the control, indicating a potential stress on the colony. • The single rate of application (145 g a.i./ha) was below the highest single application rate for use in Canada (278 g a.i./ha for strawberries and 240 g a.i./ha for alfalfa) and higher than the single rate for cucumber (144 g/ha). The cumulative rate (435 g a.i./ha) was below the maximum Canadian label rate of 835 g a.i./ha. • The overwintering conditions in California and Arizona are not comparable to Canadian overwintering conditions. • The queens are not sister queens and there was 25% africanized bees in the study which are expected to behave differently to Canadian honeybees. • Less frequency of brood inspection after each application. • A small number of brood cells were mapped therefore, reducing confidence in results.
PMRA No. 1919155. Evaluation of OBERON 2SC when Applied to a Commercial Cotton Field Food Source on Honeybee *(Apis mellifera* L.) Hives **Rate**: 280 g/ha x 2 (California) **Crop**: Cotton	• Although there were no overall effects on colony health (which was calculated as a sum of eggs, larvae, capped brood, pollen, nectar and honey), in evaluating the individual parameters, there was a decreased number of eggs and larvae after the first application (25 eggs and 99 larvae in the control compared to 7 eggs and 22 larvae in the treated hive), and a decrease in egg number after the second application (64 eggs in the control compared to 21 eggs in the treated group). This observation is consistent with the	• The single rate of application (280 g a.i./ha) was comparable to the highest single application rate for use in Canada (278 g a.i./ha for strawberries and 240 g a.i./ha for alfalfa) and higher than the single rate for cucumber (144 g/ha). The cumulative rate (560 g a.i./ha) was below the maximum Canadian label rate of 835 g a.i./ha. • The cotton plant and foraging activity for this plant is not relevant for the Canadian use pattern. • The overwintering conditions in California and Arizona are not comparable to Canadian overwintering conditions. • Lower frequency of brood inspection after each application. • A small number of brood cells were mapped therefore, reducing confidence in results. Also, the method of measuring hive parameters led to high variability in

Study	Interpretation	Uncertainties
	greenhouse study. **Therefore, indication of a decrease in eggs and larvae during study.** • Increased foraging appeared to be observed in the treated group, which could be the impact of hive stress. • Hive weight gain was statistically different as compared to the control. The treated hives gained less weight (approx. 7 lbs/hive) than control hives (approx. 28 lbs/hive).	the data, making interpretation difficult. • There was no pesticide history from the sites. • Level of exposure was not confirmed with residues. Residue analyses or pollen composition analysis were not conducted. Other bee-attractive crops were planted adjacent to the test fields. • Measured parameters for hives and bee brood did not reflect the reduction of hive-weight gain in the treatment. • Mapping size of cohorts (50 cells) was too low for observations. • The potential effects to solitary bees and biodiversity is unknown.
PMRA No. 2074465. Evaluation of OBERON 2SC when Applied to the Food Source of Honeybees (*Apis mellifera* L.) **Crop:** buckwheat (California) **Rate:** 280 g/ha	**Preliminary effects** • Mean larval survival to capping was 86.42% in controls compared to 36.9% in the Oberon treatment group. Again, although these percent survivals were not statistically different, due to high variability, the means suggest that survival was impaired. **Thus, there was an indication of larvae effects.**	• There were no biologically significant differences in adult honeybee foraging or hive health evaluations during the study. The OBERON 2SC application to blooming buckwheat indicates that there was **greater larval mortality in the treated hives than in the control hives.** However, there was great variability (0 to 100%) in the OBERON 2SC exposed replicates. There was no impact on pupal survival in the study; the treated and untreated hives had essentially complete and equivalent adult emergence and there was no delayed toxicity in the pupal stages of development. **There was a statistically significant decrease in adult emergence** when compared to the untreated control when analyzing brood success from the initial larval cohort to the successful emergence of the adult bees.

References

A. List of Studies/Information Submitted by Registrant

1.0 Human and Animal Health

PMRA Document Number	Reference
1830056	2007, Storage Stability of BSN 2060 and two metabolites in wheat forage, hay, grain and turnip root matrices, DACO: 7.3
1963098	2010, Response to PMRA Regarding the Storage Stability of Spiromesifen Residues in Sugar Beet Tops, DACO: 7.3

2.0 Environment

PMRA Document Number	Reference
1919151	2009. Honey Bee Field Study in Melons Treated with Oberon® 2SC. DACO 9.2.4.3
1919155	2008. Evaluation of OBERON™ 2SC when Applied to a Commercial Cotton Field Food Source on Honeybee *(Apis mellifera* L.) Hives. DACO 9.2.4.3
1919148	2010. A greenhouse study to determine the effects of Spiromesifen SC 240 on the honeybee, under particular consideration of effects to the development of honeybee brood.. DACO 9.2.4.3
2074465	2007. Evaluation of OBERON 2SC when Applied to the Food Source of Honeybees *(Apis mellifera* L.). DACO 9.2.4.3